

**AMENDMENTS TO THE CLAIMS**

This listing of claims will replace all prior versions and listings of all claims in the application.

**Listing of Claims**

Claims 1-15    **(Cancelled)**

16.    **(Withdrawn)** A method for increasing the signal-to-noise ratio in the characteristic optical response of an array having subpopulations of sensor elements comprising:

- a)    providing an array comprising:
  - i)    at least a first subpopulation comprising first sensor elements; and
  - ii)   a second subpopulation comprising second sensor elements;
- b)    contacting said array with a composition comprising at least a first target analyte;
- c)    obtaining a first measurement from at least two of said sensor elements of at least one of said subpopulations;
- d)    summing said first measurements from said sensor elements; and
- e)    performing a statistical analysis on said first measurements.

17.    **(Withdrawn)** The method according to claim 16 further comprising obtaining at least a first control measurement and adjusting the baseline of said first measurement against said first control measurement.

18.    **(Withdrawn)** The method according to claim 16 wherein the signal-to-noise ratio is increased by a factor of at least 10.

19.    **(Withdrawn)** The method of claim 16 wherein an analyte detection limit is reduced by a factor of at least 100.

20.    **(Previously presented)** The method of claim 27, wherein said sensor elements are beads and said array comprises subpopulations of beads dispersed on a substrate.

21.    **(Original)** The method of claim 20 wherein said substrate is a fiber optic bundle.

22. **(Original)** The method of claim 20 further comprising identifying the location of each sensor element within each sensor subpopulation within the array.
23. **(Withdrawn)** The method according to claim 16 wherein said sensor elements comprise chemical functional groups.
24. **(Withdrawn)** The method according to claim 16 wherein said sensor elements comprise oligonucleotides.
25. **(Withdrawn)** A method for amplifying the characteristic optical response of an array having subpopulations of sensor elements comprising:
- a) providing an array comprising:
    - i) at least a first subpopulation comprising first sensor elements; and
    - ii) a second subpopulation comprising second sensor elements;
  - b) contacting said array with a composition comprising at least a first target analyte;
  - c) obtaining a first measurement from at least two of said sensor elements of at least one of said subpopulations; and
  - d) summing the optical responses.
26. **(Withdrawn)** A method according to claim 25 further comprising obtaining at least a first control measurement and adjusting the baseline of said first measurement using said first control measurement.
27. **(Currently Amended)** A method comprising:
- a) providing an array with a plurality of subpopulations of sensor elements, ~~wherein the plurality of subpopulations of sensor elements comprising a first subpopulation comprising said subpopulations comprise~~ sensor elements having the same first bioactive agent and a second subpopulation comprising sensor elements having the same second bioactive agent;
  - b) contacting said array with a composition comprising at least a first target analyte, thereby producing a response signal at said sensor elements of at least one of said first and second subpopulations;
  - c) obtaining individual ~~measurements~~ response signals from at each of said sensor elements ~~having the same bioactive agent from at least one of said a first of said plurality of first and second subpopulations~~ from at least one of said a first of said plurality of first and second subpopulations; and

d) performing a statistical analysis on said ~~measurements~~ response signals from at least one of said first of said plurality of and second subpopulations, whereby statistical validity of said ~~measurements from said sensor elements having the same bioactive agent~~ response signals is determined.

28. **(Cancelled)**

29. **(Previously Presented)** The method according to claim 27, wherein at least one of said bioactive agents is a nucleic acid.

30. **(Previously Presented)** The method according to claim 27, wherein at least one of said bioactive agents is a protein.

31. **(Previously Presented)** The method according to claim 20, further comprising determining outlying beads and excluding outlying beads from said subpopulation.

32. **(Currently Amended)** The method according to claim 27, wherein said statistical analysis comprises calculating the mean of at least said ~~measurements~~ response signals from said first of said plurality of subpopulations.

33. **(Currently Amended)** The method according to claim 27, wherein said statistical analysis comprises calculating the standard deviation of at least said ~~measurements~~ response signals from said first of said plurality of subpopulations.

34. **(Currently Amended)** The method according to claim 27, further comprising evaluating the statistical validity of said ~~measurements~~ response signals.

35. **(Currently Amended)** The method according to claim 27, further comprising performing a second statistical analysis on said ~~measurements~~ response signals.

36. **(Currently Amended)** The method according to claim 35 wherein said second statistical analysis comprises evaluating said measurements using confidence intervals.

37. **(Currently Amended)** The method according claim 35, wherein said second statistical analysis comprises using said ~~measurements~~ response signals to perform hypothesis testing.

38. **(Currently Amended)** The method according to claim 27, further comprising comparing said statistical analysis of ~~measurements~~ response signals obtained from at least two subpopulations.

39. **(Currently Amended)** The method according to claim 38, wherein said statistical analysis comprises performing a cluster analysis of ~~measurements~~ response signals from each of said subpopulations.

40. **(Withdrawn)** A method comprising:

- a) providing an array comprising beads on a substrate comprising a plurality of subpopulations of sensor elements, wherein each sensor element comprises a bioactive agent that will bind a target analyte, and at least two of said subpopulations comprise different bioactive agents that will bind the same target analyte;
- b) contacting said array with a composition comprising at least a first target analyte;
- c) obtaining a measurement from the optical response of each sensor element; and
- d) performing a statistical analysis on said measurements from each sensor element.

41. **(Withdrawn)** The method according to claim 40, wherein at least two of said subpopulations each comprise bioactive agents that will bind different target analytes.

42. **(Withdrawn)** The method according to claim 41, wherein at least one of said bioactive agents is a nucleic acid.

43. **(Withdrawn)** The method according to claim 41, wherein at least one of said bioactive agents is a protein.

44. **(Withdrawn)** The method according to claim 40, further comprising, determining outlying beads and excluding outlying beads from said subpopulation.

45. **(Withdrawn)** The method according to claim 25, further comprising:

- e) performing a statistical analysis on said measurements of at least one of said subpopulations.

46. **(Previously Presented)** The method according to claim 27, wherein said substrate is selected from the group consisting of glass and plastic.

47. **(Previously presented)** The method according to claim 20, wherein said substrate is selected from the group consisting of glass and plastic.

48. **(Withdrawn)** The method according to claim 17 wherein said adjusting comprises subtracting said first control measurement from said first measurement.